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ABSTRACT

Manpower information and projections in postsecondary education have present value in the sense that they guide today's decisions based on a view of what tomorrow's world will be like. But manpower decisions are complicated by the fact that the decision-maker, be it a government, an institution, or an individual, must also take account of how others will react when making their decision. Manpower approaches in American postsecondary education are growing in scope, sophistication, applicability, and influence; yet they are imperfect instruments that must be used with great attention to their inherent limitations and to the nature of decision-making in higher education. The coming years will demand greater care in the application of manpower approaches to postsecondary education, and the penalties for mistaken conclusions promise to be heavy. (Author/MSE)

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Donald M. Norris, William F. Lasher, and Floyd S. Brandt

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Donald M. Norris, William F. Lasher, and Floyd S. Brandt

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Foreword

In the past several years, if you wanted to enliven conversation among higher education faculty and administrators, all you had to do was mention the use of manpower projections and manpower studies in academic planning. The degree of interest and the degree of distrust about these topics was made abundantly clear to us as we began planning this Research Report.

At one extreme was the response that we should not undertake such a report: "The less said the better." When these types of respondents were pressed for reasons for their position, the replies were all centered on a general apprehension about manpower studies. In particular, there was a general fear of misuse of manpower data; a belief that because many manpower studies have historically proven to be inaccurate, they should not be used to plan for the future; and a sense that because of the egalitarian philosophy that dominates the higher education scene, anything that discourages people from seeking further education had to be suspect.

On the other extreme were those who gave us great encouragement to pursue this report because they believed that manpower studies should be the primary basis for all planning. This was especially true for collegiate course-planning and career guidance. While acknowledging that the science of manpower studies had a flawed track record, they nevertheless felt that this data was accurate enough to use as a basis for policy decisions.

The assignment given to Donald M. Norris, assistant director, and William F. Lasher, director, Office of Institutional Studies, and Floyd S. Brandt, director, Office of Analysis and Planning at the University of Texas at Austin, was to review, analyze, and put into order the controversy that surrounds manpower projections and manpower statistics. I believe that the reader will find they have admirably accomplished this challenging task. I would especially call the reader's attention to the chapter titled "Improving the Use of Manpower Studies." Here the authors bring together the major limitations and appropriate uses of manpower studies in higher education and offer suggestions for improving them.

Jonathan D. Fife, Director
ERIC Clearinghouse
on Higher Education

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Overview

Manpower studies in education have attempted to compare the supply of degree holders with the demand for various types of educated manpower. These studies have aided individuals making career and educational decisions by making available both current manpower information and projections of the future relationship between supply and demand. Manpower projections have also been useful to educators and state and federal officials in coping with major educational challenges during the past thirty years.

Since these challenges have included accommodating considerable increases in the number of students and reducing projected shortages of scientists and teachers, manpower studies in higher education have emphasized supply, i.e., enrollments and degrees awarded. In its most extreme form, this emphasis has reinforced the American attitude that a growing economy has an almost infinite capacity to absorb educated manpower. During the seventies educators have been forced to recognize that there are limits to the opportunities society can offer college graduates. The current unemployment and underemployment of bachelor's and graduate degree holders have reinforced the importance of the relationship between supply and demand in education and have heightened the interest of both educators and government officials in manpower approaches.

This interest has been strengthened by the expansion of the definition of "higher education" to the more inclusive concept of "postsecondary education." Many of the occupational areas within the scope of postsecondary education are very receptive to manpower approaches. The missions of some institutions, such as community colleges, encompass both the occupational and higher education ends of the manpower continuum. For these reasons, the definition of manpower supply and demand studies in postsecondary education must embrace the conditions of individuals ranging from certificate holders from proprietary schools through doctoral scientists.

Past projections of supply and demand have been plagued by considerable inaccuracies caused by faulty assumptions, incomplete data, and methodological imperfections. But the greatest source of imprecision has been the practice of projecting the supply and the demand for educated manpower without taking into account the relative balance between the two. Such techniques, known as *fixed-*

coefficient models, are based on extrapolating past trends; even though they employ sophisticated techniques, they do not recognize the interrelated nature of the supply of educated people and the demand for them in the marketplace. In reality, the actual levels of supply and demand that ultimately occur depend on the developing "balance" between the two. In recent years, a variety of new projection techniques has enabled forecasters to incorporate the effects of this marketplace interaction in their projections. Most researchers believe that these new *market-responsive models* promise better, more accurate manpower projections.

At the present time the educator is confronted with a bewildering diversity of manpower projections in postsecondary education. Projections range across the full extent of the manpower continuum, yet few provisions have been made for interactions among the different segments. Occupational manpower information systems have evolved independently from those in higher education. Most routine projections from groups like the Bureau of Labor Statistics and National Science Foundation continue to use fixed-coefficient approaches, so projected shortages or oversupplies cannot be expected to appear to the extent predicted. On the other hand, the new generation of market-responsive projections, such as those created by Dresch, Freeman, and Cartter, vary widely in their views of the future. Different assumptions, methodologies, and opinions concerning the market responsiveness of college students have caused the discrepancies among these new approaches.

Despite the vast differences in their specific predictions, all of these manpower projections foretell a remarkably similar future. The number of new entrants into the labor force will not grow over the next few decades as substantially as in the recent past. Nevertheless, there will be a developing tendency toward "oversupply" of many types of highly skilled and educated manpower. This could potentially cause a reduction in the economic rewards resulting from a college education and increased underemployment and unemployment of college-educated manpower. These conditions could materially alter the patterns of individual educational and career decisions. The competition among occupationally-trained and college-educated persons for many types of jobs will likely increase. There is some indication that the biggest losers in this highly competitive climate will be those with only a high school diploma or an associate degree.

Educational institutions will be doubly affected by these conditions in their dual roles as producers and users of educated manpower. Enrollments are expected to decline to some extent in the eighties due

not only to the inexorable effects of demography but also to the market responses by students to the highly competitive climate. Academic opportunities for Ph.D.'s will shrink dramatically, and most new Ph.D.'s will be employed in nonacademic settings or even in jobs largely unrelated to their fields. Faculties with high tenure ratios, a lack of junior faculty positions, declining monetary rewards, and increased collective bargaining are potential second-order outcomes that may result.

An assessment of current manpower approaches reveals a genuine lack of understanding of "student collective choice behavior." The extent to which students respond to current market conditions is simply not understood in sufficient detail. This is crucial, because student and institutional adaptation has always been the best way to adjust to a condition of impending supply and demand imbalance. Also, the inner workings of the current labor market for faculty are not sufficiently understood. Such an understanding is important because institutions will most probably need to make major faculty adjustments in response to the market conditions of the next decades.

The history of manpower projections in the U.S. and abroad suggests that a two- to three-year forecast is the maximum that can be undertaken with sufficient accuracy to guide policy-making. This suggests that active governmental "fine-tuning" of the labor market based on manpower supply-and-demand studies should be limited to the occupational end of the manpower continuum. Even here, care must be taken to insure that adequate recognition is made of probable reactions to market conditions by students, faculty, and institutions before governmental measures can be applied. On the other hand, governmental intervention in higher education should be concerned with providing long-range support of important educational goals, leaving major market adjustments to individuals and institutions.

This does not mean that manpower supply-and-demand studies in higher education are trivial; merely that they must be used carefully with an eye to their limitations. Indeed, manpower studies will be very important in assessing where governmental action is needed and what the potential long-range impact of policies is likely to be. In addition, they will serve as an early-warning system for market adjustment problems, such as the developing need to produce greater numbers of energy scientists. Also, market projections can draw attention to problems that are beyond the purview of individual decision-makers. Demographic changes, the increasingly competitive environment, and the condition of the academic labor market are good examples. In fact, one of the most useful applications of manpower

studies for institutions is to consider the impacts of second-order problems, such as tenured-in faculties, that can be addresesd before they become unmanageable.

This does not mean that government will use manpower studies only to build and nurture the educational system. When underemployment becomes even more endemic and college graduates begin to compete even more zealously for choice positions, government will surely question the wisdom of this "runaway" competition. While educators can argue convincingly that the "overeducated American" is an illusion and that education is a boon to society, government will question any benefit that costs so dearly and has equivocal side-effects. Governmental scrutiny has been limited to specific fields of study, such as humanities and teacher education. In the future the level of support for higher education in general may be queried. Manpower studies will most probably be a primary vehicle for focusing this debate.

A great deal of research is currently underway on student collective choice behavior, faculty employment patterns, market-responsive models, and similar topics. There are indications that greater interactions are developing between manpower researchers and among different manpower information systems. These factors promise better manpower supply-and-demand forecasts in the future.

Manpower Studies in American Higher Education

From its beginnings, the American experience characteristically has sought to protect the individual's right of free choice within the smallest unit. The nation's philosophical and constitutional bias against centralization has influenced every aspect of the lives of its citizens, including the manner in which they define and address social problems. Disenchantment with centralized agencies and an orientation toward a "marketplace" approach to the resolution of manpower issues have provided little support for the type of centralized, comprehensive manpower planning efforts initiated in many European and developing nations. Although we have used national manpower studies, their major applications have been to guide the decentralized decision-making of individuals and educational institutions and the relatively limited interventions of government.

Indeed, for many years the federal government did not assume an active role of any sort in manpower activities. However, stimulated by the Depression in the thirties, government intervened to influence manpower usage in the economy. The New Deal's programs of unemployment insurance and job creation were supplemented in the fifties and sixties by growing federal aid to education to avoid developing shortages of educated manpower and to expand educational opportunity. Manpower programs of the "Great Society" were initiated to aid the most poverty-stricken portion of the labor force. Despite their growing number, these federal programs attempted narrow solutions to specific manpower programs rather than supporting a genuine national manpower plan. Short-term fluctuations in the market supply of manpower were addressed by specific "countercyclical" initiatives. More permanent inequities in the labor market were addressed by "structural" manpower programs. Thus, the U.S. has not been guided by carefully conceived, comprehensive manpower planning, but by a *de facto* accumulation of several decades worth of federal and state programs dealing with an assortment of specific educational and employment problems (Clague and Kramer 1976).

While the role of manpower planning in the U.S. has been limited, it has been even more circumscribed in its application to higher education. Many educators have considered manpower approaches to be characteristic of the "vocationalism" appropriate to trade schools but not to colleges and universities. Moreover, since the U.S. has ex-

perienced shortages of skilled and educated labor through much of its history, leaders in government and education have been primarily concerned with the supply rather than the demand for educated manpower. Seldom has there been any questioning of the economy's ability to absorb almost any supply of educated manpower.

Despite these limitations, manpower studies in higher education have enjoyed increasing use since World War II. Prior to that time, studies dealing with educational manpower were virtually nonexistent. The lack of reliable national data and the embryonic nature of manpower techniques dictated a philosophical rather than empirical treatment of manpower concerns. Over the past thirty years, an increasingly sophisticated series of manpower studies has assisted educators and government in meeting the major educational challenges of that period.

These challenges included accommodating returning veterans following World War II, reducing the projected shortages of scientists and teachers in the fifties, and sustaining the increased demand for higher education caused by the demographic boom of the sixties and by the push for universal higher education. Manpower studies foretold the extent of these challenges and encouraged an impressive series of governmental programs to expand higher educational offerings and opportunities. The needs of public policy encouraged the expansion of manpower information systems and the improvement of manpower forecasting techniques. The nature of these challenges also reinforced the basic American predilection to be concerned primarily with increasing the supply of educated manpower.

By the mid-sixties, however, it was clear that manpower studies, despite their increasing sophistication, had been grossly inadequate in predicting future conditions. To be sure, inaccurate or untimely data and simplistic methodology could be blamed to some extent. Many studies were grounded on faulty assumptions that reflected the prevailing wisdom of the time. But by far the most significant factor in the inaccuracy of manpower forecasting was a fundamental discrepancy between manpower projection techniques and the actual functioning of the marketplace. Manpower studies independently projected the supply and demand for educated manpower using *fixed-coefficient models*. In reality, supply and demand are interdependent. The actual level of each depends on the relative "balance" between the two. Imbalances lead to incentives that tend to diminish projected undersupplies or market gluts. Perceptions of these shortcomings of manpower approaches led to even more vigorous questioning of their applicability to higher education.

Nevertheless, the seventies have witnessed a rekindled interest in manpower approaches to higher education. The projected manpower shortages of earlier years have been replaced by the reality of developing oversupply and underemployment of college graduates as well as heightened competition for jobs. The demand for educated manpower now attracts as much attention as supply. The shortcomings of fixed-coefficient models may be overcome by the emergence of a new generation of *market-responsive models* that incorporate the relationship between supply and demand. Market-responsive techniques and better data portend more accurate and timely forecasting.

These factors, plus increased governmental interest, have led traditional education to be increasingly concerned with manpower issues, even if in mere self-defense. In recent years the evolution of the notion of "postsecondary education" has focused greater attention on occupational offerings and institutions. Educators today must be concerned with a "manpower continuum" whose span embraces institutions ranging from proprietary schools through major research universities. While different manpower approaches are appropriate for different segments of the manpower continuum, the interactions among these segments are increasing. The insular 'segmentation" that has characterized manpower approaches in the past may be unacceptable in today's postsecondary environment.

At this time of increased interest in manpower studies that employ new research techniques, it is especially appropriate to review the development and use of manpower studies in higher education during the past three decades. Many objections to manpower approaches do not recognize the advances that have been made in recent years. On the other hand, some of the new manpower initiatives do not take into account the enduring limitations to manpower studies in higher education.

The Tidal Wave of Students and Shortages of Educated Manpower

From the end of World War II through the mid-sixties, American higher education focused on expanding education to meet the educational needs of American democracy and to diminish potential shortages in certain skilled professions, especially engineers, scientists, and teachers. The President's Commission on Higher Education (1947) initiated this era by issuing a call to expand education to satisfy the demands of a generation of students who were forced to postpone their education. The Truman Commission called for impressive increases in enrollments and in faculties to enable higher education to address the problems of the postwar world.

The proposals of the Truman Commission did not pass unchallenged. In *The Market for College Graduates,* Seymour Harris (1949) claimed that if the recommendations of the Truman Commission were fulfilled, the nation's economy would be unable to absorb the torrent of new college graduates. The net result would be a generation of disappointed college graduates, unable to find the "coveted" positions they had been led to expect their education would insure.

The recommendations of the Truman Commission understated both the levels of enrollment that actually occurred by 1960 and the demand of the growing American economy. Harris' dire predictions of market glut proved incorrect because he had assumed that college graduates would be employed in traditional professional and managerial roles. In reality, the postwar period witnessed increasing employment of college graduates in jobs that previously required no more than a high school diploma. The failure of the Harris predictions "is often cited to support the claim that the United States cannot produce too many educated people for the labor market to absorb" (Breneman 1975, p. 132). This viewpoint reinforced the fundamental American emphasis on increasing the supply of educated persons.

The next fifteen years produced a succession of projections auguring shortages of educated manpower. Dael Wolfle's *America's Resources of Specialized Talent* (1954) and the Ford Foundation's *Teachers for Tomorrow* (1955) projected shortages of teachers and researchers with Ph.D.'s. A similar view was portrayed in projections performed by the Bureau of Labor Statistics (1961) for the National Science Foundation and published in *Scientists, Engineers and Technicians in the 1960's.* In a series of projections conducted from 1953 through 1963, the National Education Association predicted even graver consequences: the output of Ph.D.'s would be inadequate to meet the needs for faculty in the growing colleges and universities, and the percentage of faculty having earned doctorates would decline from 40 percent to an intolerable 20 percent (Maul 1963).

At the institutional level, educators were concerned with how they were to accommodate the legions of students who were descending on their campuses. In 1954, Ronald Thompson published *The Impending Tidal Wave of Students,* which warned of the even greater student boom that would hit campuses in the late fifties and early sixties. Given the apparent shortages in many fields, educators became conditioned to dealing with more and more students, focusing almost solely on enrollments and the supply of degree holders. "Manpower studies" came to be viewed as nearly synonymous with "enrollment

projections." The effect of this conditioning was to endure even after events would prove that the projected shortages had not materialized.

Federal Educational Programs and Improved Manpower Capabilities

The projections of increased demand for education and of shortages of college graduates were instrumental in encouraging active federal programs. The GI bill of rights, the National Defense Education Act of 1958, the Higher Education Facilities Act of 1963, and the Higher Education Amendments of 1965 supported clearly identified educational needs. However, in addition to reacting to projected shortages, the federal government began to develop an interest in more comprehensive manpower planning and in providing information for use in individual and institutional manpower decisions. For example, the Vocational Educational Act of 1963 called for state vocational boards and the public employment service to provide occupational information pertaining to reasonable prospects of employment. The Manpower Development and Training Act of 1962 specifically required the Secretary of Labor to provide the President with an annual report regarding manpower requirements, resources, use, and training (Ahamad and Blaug 1973, p. 49).

In reports to the President in 1963 and 1965, the Department of Labor attempted to fulfill its mandate to furnish information on manpower requirements. These reports developed estimates of "educational requirements" derived by applying a projected level of average educational attainment to the projected occupational distribution. Ahamad and Blaug (1973) have suggested that the manpower reports erred by treating educational requirements for occupations as though they were relatively constant.

The federal manpower initiatives relating to higher education were only one portion of the federal government's programs to influence manpower issues in the American economy. The Manpower Development and Training Act of 1962, the Vocational Education Act of 1963, and the "Great Society" programs of the Johnson years were directed at improving the use of occupational manpower. In addition to focusing almost exclusively on the supply of labor and its placement, these programs were overwhelmingly concerned with the most disadvantaged portions of the labor force as well as poverty-stricken regions of the country (Clague and Kramer 1976). The expanding federal role in occupational education, which had little impact on higher education at the time, has come to be more salient in recent years, as many institutions have begun to service occupational needs.

Projection Inaccuracies and Critiques

The errors in Harris' predictions of a glut of overeducated college graduates have already been explored. Since it was abundantly clear by the early fifties that his projections were inaccurate, Harris' warnings did not impede the expansion of American higher education. In addition, his views ran counter to the prevailing educational wisdom of the time, so it is not surprising that higher education followed the more palatable advice of the Truman Commission and embraced expansion. Yet the manpower and enrollment projections of the next fifteen years, the ones that projected chronic shortages of educated manpower and faculty and motivated substantial governmental programs, proved also to be grossly inaccurate.

What had happened to the shortages that seemed so imminent in the mid-fifties? The projected shortages failed to materialize primarily because enrollments and degree output grew faster than anyone anticipated. The high demand for education in the early postwar years, the emphasis on scientific education provided by the Sputnik era, and the increase in government resources committed to education constituted a combination of conditions that increased enrollments and degree production to unforeseen levels. Enrollment forecasts of the period, which were based on historical trends in enrollment, failed to foresee this growth and consistently underestimated actual enrollments (Mangelson et al. 1974).

A few figures illustrate the nature of this growth. Most of the growth in enrollments occurred because of increasing rates of attendance, not increasing numbers of college-age students. It is estimated that during the fifties, fully 80 percent of the increase in collegiate enrollments was attributable to increased rates of college attendance among young people. Increased attendance rates continued and accounted for a robust 55 percent of the enrollment growth in the sixties (Carnegie Commission 1971). Moreover, the economic rewards of education were increasing. From the late fifties through as late as 1969, relative salaries rose for holders of baccalaureate degrees (Freeman 1975) and for collegiate faculty (Freeman and Breneman 1974). Finally, most of the increased number of graduates ultimately were employed not in traditional managerial and professional jobs, but in "lower-level" occupations. Between 1940 and 1960, about 85 percent of the increase in educational attainment could be attributed to increased educational levels within occupations, while only 15 percent resulted from actual shifts in occupational structure (Folger and Nam 1964, p. 29). Thus, the increased numbers of degree holders were absorbed quite

successfully by an upgrading of the educational levels for many occupations.

The manpower projections of the late fifties and early sixties provide clear examples of the shortcomings of fixed-coefficient projections. The developing manpower shortages caused economic and social incentives that motivated institutions and individuals to close the gap. These reactions were enhanced by the decisive interventions of state and federal governments. A basic tenet of forecasting must be remembered: *projections are not predictions of future events, but rather projections of what would happen if past trends continued unaltered.* Indeed, one criterion for evaluating the success of projections under conditions of impending shortage or surplus is their success in motivating public action to solve a problem. In that case, the projections of shortages of scientists and teachers in the late fifties and early sixties might be viewed as outstanding successes (Cartter 1974).

Many of these projections contained errors of logic and/or methodology that magnified their basic inaccuracy. For example, forecasts of enrollments underestimated actual enrollments during the period because they utilized past trends in actual enrollments to project future enrollments, rather than the trends in demography and the increasing attendance rates that were causing enrollments to grow. The NEA exaggerated its projected shortage of faculty by assuming a 6 percent replacement rate—the rate at which faculty die, retire, or become employed outside academia—when in reality, the rate was about 2 percent (Cartter 1965).

One of the strongest indictments of these studies is that they continued to predict future teacher shortages long after it should have been apparent from existing information that the estimated shortages were overstated. As early as 1960, Bernard Berelson warned that

> the sense of crisis that makes discussion of graduate education sound shrill these days is unwarranted and misleading. There is a problem, to be sure, but not one of the magnitude now commonly accepted (Berelson 1960, p. 70).

In 1965, Allan Cartter provided the first numerical refutation of those projecting teacher shortages and a deterioration of the ratio of faculty holding earned doctorates. In addition to citing the inherent tendency of these studies to understate enrollment growth, Cartter suggested that "both educational researchers and responsible government agencies have collected the wrong information for many years and drawn hasty conclusions from imperfect data" (Cartter 1965, p. 268).

Manpower Projections Under Fire—By the mid-sixties, manpower

projection in higher education and the growing number of federal studies of occupational manpower had come under attack. The failure of existing techniques to consider the adjustment of the market to supply and demand caused the builders of such imperfect models to be dismissed as mere "technicians" (Anderson and Bowen 1967). Moreover, economists reacted unfavorably to the confusing manner in which some manpower forecasters interchanged "employment," "demand," "requirement," and "needs," terms that have precise economic uses (Ahamad and Blaug 1973, p. 66). A federal investigation by the Working Group on Manpower Projections of the President's Committee on Manpower found that many projections: (1) underemphasized the critical role of underlying assumptions; (2) were often performed hastily to provide policy guidance; and (3) suffered from poor communication between agencies that often resulted in duplication. The Working Group advanced the opinion that "insufficient attention had been paid to providing alternative projections, to estimating the range of uncertainty of projections, and to problems of evaluation by objective standards" (Ahamad and Blaug 1973, p. 50). Many felt that projections were inextricably hamstrung by the state of the forecaster's art.

It became clear that existing manpower forecasts were imperfect tools for viewing the future. While it was evident that the prospects for shortages of Ph.D. scientists and teachers had been overstated, forecasters could not agree on the future. As early as the mid-sixties, Allan Cartter (1965) had already suggested that there might be an oversupply of Ph. D.'s in certain fields by 1970. His projections passed largely unheeded. Educators were still preoccupied with the task of educating the increased numbers of students who were continuing to flood the campuses. Driven both by increased numbers of 18 to 24-year-olds and by a continued growth in the rate of college attendance, enrollments continued to burgeon. Conditioned by years of growth to think in terms of supply alone, educators were concerned primarily with making education available to all who wanted it. They found few uses for manpower analyses, especially those that foretold declining employment prospects for certain types of college graduates.

Faltering Enrollments and Increasing Interest in Manpower Studies

The unhesitating belief that higher education would continue to grow indefinitely began to waver in the late sixties. Employment difficulties in selected professions demonstrated that education was not an unequivocal guarantee to a lucrative job. Every passing year brought more examples of what many came to regard as an oversupply

of highly educated manpower. As a result, manpower approaches to education attracted renewed attention, in spite of their recognized shortcomings.

A number of factors in the late sixties served as leading indicators of potential supply and demand imbalances. For example, the market for teachers weakened. From 1968 onward, the percentage of teacher education graduates who immediately entered the classroom declined dramatically (NEA 1973, p. 16). Between 1969 and 1972, the market for engineers also became appreciably less attractive (Freeman 1976). But this came as no great surprise to engineering educators, since the profession periodically had undergone cyclical fluctuations. Indeed, engineering is a classic example of a profession exhibiting what economists refer to as "cobweb" behavior. During periods in which shortages of engineers exist and relative economic rewards are therefore high, large numbers of students are drawn to the field, leading inevitably to lower economic rewards and declining enrollments as supply begins to exceed demand (Freeman 1976). Nevertheless, the appearance of apparent oversupplies, even if only temporary, resurrected the issue of supply and demand for college graduates.

To the surprise of many educators, enrollments in the early seventies did not grow by the amounts anticipated by most enrollment projections of the time (Mangelsen et al. 1974). In fact, despite the continuing growth in the number of college-age students, full-time in-college enrollments and the number of students enrolled in full-time degree programs actually declined for some types of institutions. Jolted by these developments, educators received with interest the new group of "trend-demographic" projections that projected enrollments based on trends in demography and attendance rates of college age students. These projections foretold a new reality for higher education. The now familiar "go-stop-go" enrollment pattern, popularized by the Carnegie Commission on Higher Education (1971, 1973) and by other forecasters, projected enrollments as increasing to 1980, declining slightly during the eighties, and increasing after 1990. As the seventies progressed and gloomier views of the future prevailed, successive projections deepened the estimated decline in the eighties and dampened the recovery forecast for the nineties (Norris 1976).

Ex post facto analysis revealed that the declining enrollments in the seventies were caused by decreasing high school graduation rates, smaller percentages of white males attending college, and eroding college graduation rates (National Science Foundation 1974). The declining participation rate of white males was truly significant, coming on the heels of two decades of consistent and substantial increases in

the propensity to attend college. Most observers of the time attributed the drop to the end of the draft, disenchantment with education as a result of the unrest of the sixties, and other related phenomena. Recent analysis has suggested that the decline in rate of collegiate attendance may have been the result of logical marketplace behavior in response to diminishing economic rewards of education for many students (Freeman 1976).

Based on developments such as these, the seventies have witnessed a new interest in manpower applications in higher education. The educational community finally has accepted Allan Cartter's predictions of declining demand for Ph.D.'s in colleges and universities and potential oversupplies in many fields. Recent projections by the National Science Foundation (1975) and by the Bureau of Labor Statistics (1975) dealing with the supply and demand for scientific manpower, while differing in their exact numerical results, predicted an impending oversupply of Ph.D.'s if graduate enrollments do not increase in response to the glutted market in some fields. While the National Board on Graduate Education (1975) has recommended that institutions adapt to this new reality, substantive institutional response has thus far been minimal.

A great deal of attention has been focused on economic saturation and the employment difficulties of college graduates in the past few years. The prospect of legions of Ph.D.'s unable to find work or driving taxicabs has received considerable popular attention. Stephen Dresch's "economic saturation" enrollment model (1975) expanded on the trend-demographic approach of most enrollment projections to include the effects of economic-choice behavior on enrollments. Based on his particular model, Dresch predicted a substantial decline in enrollments in the eighties followed by a continued deterioration in the nineties. While it appears that his assumptions may have been far too severe, Dresch's model attracted considerable attention to the possible effects of economic saturation. These included the problems of unemployed graduates and the far greater number who were "underemployed," i.e., employed in a job incommensurate with their college training. While the upgrading of levels of educational attainment in most occupations had been occurring since the forties, this condition finally caught the public's attention in the early seventies. By some estimates, the rate of underemployment among new graduates in the seventies had grown to about 30 percent for men and 60 percent for women (Freeman and Holloman 1975).

The growing interest in educational manpower research was reflected in two National Science Foundation conferences, which were

convened to consider the problems of manpower supply and demand projection, with special emphasis on the graduate level. The 1974 conference concluded that forecast methodology was in a state of flux. While the participants in the 1972 conference had criticized existing fixed-coefficient models, by 1974 a significant number of market models had been developed. The summary report of the 1974 conference suggested that these models and a better understanding of student behavior could appreciably enhance the accuracy and value of manpower approaches (NSF 1974).

Since that time, the interest in manpower studies in education has grown even more. Enrollments in fall 1975 and 1976 have befuddled forecasters; there were strong indications that they were influenced by the state of the economy. This scored yet another point for those favoring an economic perspective. The publication of Richard Freeman's *The Overeducated American* (1976) provided a manpower supply-and-demand interpretation of the past two decades in American higher education and projections of future conditions. Using the "Recursive Adjustment Model" developed at the Center for Policy Alternatives at the Massachusetts Institute of Technology, Freeman based his analysis on a market model that linked supply and demand. His analysis suggested that college students would continue to be highly responsive to market conditions and that major market adjustments would occur in the coming years.

Freeman's assumptions and analysis have been criticized on a variety of grounds. The contention that economic rewards from education have been declining has been questioned by Witmer's (1976) calculations of social return on educational investment. In the view of some, Freeman's reliance on student-market responsiveness does not take adequate account of the noneconomic motives for college attendence. For example, Cartter's market-responsive model (1976) assumes that undergraduate enrollments, in total, are largely due to social and cultural motivations rather than economic factors. Nevertheless, Freeman's work provides a highly provocative viewpoint and has stimulated interest in manpower supply-and-demand approaches.

The popularity of manpower approaches in postsecondary education is reflected in the large number of regional, state, or special-purpose projections that have appeared in recent years. For example, many regional, state, or local projections of occupational manpower supply and demand are based on applications of the techniques and information developed by the Bureau of Labor Statistics. In addition, many professions have generated manpower studies that have appeared in professional journals or at professional meetings. There is

scarcely an academic discipline that has not recently projected the demand for its graduates. While these projections by discipline are often simplistic or self-serving, they appear to be quite influential in guiding academic decision-makers.

The Emergence of Postsecondary Education

Even as higher education has become more aware of the usefulness of manpower approaches in assessing its traditional programs, an increased interest in "occupational" manpower has overtaken the educational community. For years traditional education has shunned occupational offerings as inappropriate to its mission. Yet, when one combines enrollment in occupational programs in community colleges with students in noncollegiate proprietary schools, one ends up with a group larger than the traditional collegiate sector (National Commission on the Financing of Postsecondary Education 1973). The importance of this group has been recognized with the expansion of the notion of "higher education" into the concept of "postsecondary education."

By dealing with postsecondary education, the focus of the educational community has been broadened to include a new portion of the manpower continuum, a segment whose major interest is "training" rather than "education"; whose emphasis is on occupational offerings that end in specific jobs rather than general preparation for a fuller life; and whose time-frame is two years or less rather than four years or more. Not only are new categories of institutions now considered under the umbrella of postsecondary education, but many community colleges and even four-year institutions have expanded their occupational offerings.

In recent years, federal programs dealing with occupational manpower have been decentralized in nature, as exemplified by initiatives authorized under the Comprehensive Employment and Training Act (CETA) of 1973. This movement has increased, not diminished, the need for good manpower data, since decentralized programming requires both reliable national data and the capability to translate it into state and local settings. The recently established National Occupational Information Coordinating Committee (NOICC) is intended to encourage similar coordinating organizations at the state level for the purpose of improving the quality and use of occupational manpower information. Additional federal funds are being earmarked for improved manpower information systems, which the government hopes will be instrumental in improving student career choice and fighting unemployment.

Occupational training is even more conducive to manpower approaches than traditional higher education, due to shorter timeframes for certificate completion, more clearly identifiable career tracks, and localized labor markets. As a result, different manpower approaches are suitable for the different segments of the manpower continuum. In recognition of this, existing information systems for occupational and higher education have developed in a largely independent fashion. While appropriate in an earlier time, this segmentation may restrict necessary linkages between different portions of the manpower continuum. In addition to recognizing the need for different treatments, it may also be time to build bridges linking manpower approaches to occupational and higher education.

Manpower Projections of the Seventies

The preceding chapter charted the evolution of manpower supply-and-demand projections and their applications to postsecondary education. The purpose of this chapter is to focus on a number of the most recent generation of manpower studies that are the most important to postsecondary education. The nature of their findings, critiques of their shortcomings, and their relative usefulness to educational decisionmakers are discussed.

With the growing interest in occupational manpower, an appropriate evaluation of manpower studies in postsecondary education must cover the full range of the manpower continuum. Thus the narrative begins with a treatment of economy-wide occupational projections and their applications to higher education. It then proceeds to projections of undergraduate enrollment and baccalaureate degree production, the labor market for Ph.D.'s, and the market prospects for women, minorities, and particular subsets of the professional work force, such as engineers, lawyers, and doctors.

The Projection Program of the Bureau of Labor Statistics

The Bureau of Labor Statistics (BLS) regularly produces current manpower data and projections of occupational supply and demand for the economy at large. These interrelated projections deal with the future size and composition of the work force, the nature of the economy and its rate of growth, and the size and structure of industries and occupations. The projections of occupational requirements are also converted to projections of "educational requirements." By combining these projections with projections of degrees awarded, which are furnished by the National Center for Educational Statistics, a rough notion of supply and demand is attained. The importance of the BLS projections is magnified considerably because the majority of derivative manpower projections performed at state and local levels and by many institutions use these same statistics and methodology.

Projections of the Labor Force—The most recent BLS projections of the American labor force portend a slower rate of growth over the next fifteen years than has characterized the recent past. Table 1 compares changes in the size of the labor force and participation rates for men and women. The smaller rate of growth can be attributed primarily to the decreasing numbers of young people who will be

available to the labor force during this period. Although the participation rate for men over 16 is expected to level off, the participation rate for women is expected to continue to grow. This forecast predicts a work force larger by 3.3 million in 1990 than that projected in a similar forecast by the BLS in 1973. The major causes for the change are a recognition of the continuing increases in participation rates for women and some modest changes in methodology (Fullerton and Flaim 1976).

Projections of Occupational Structure—One of the most significant BLS projection activities is the distribution of its overall projection of labor force employment to specific occupations. Between 1974 and 1985, the largest percentage increases are expected among white-collar workers—with professional/technical and clerical workers exhibiting the greatest growth—and among service workers other than those performing service in private households (Carey 1976). By 1985, nearly two-thirds of the labor force is expected to be white-collar or service workers. During this period, a larger proportion of the job openings in many sectors will be attributable to replacement rather than to expansion of job opportunities.

Table 1. Projections of Civilian Labor Force and Participation Rates, 1975-1990 (Workers Over 16 Years of Age)

Civilian Labor Force (thousands)

	Actual		Projected		
	1970	1975	1980	1985	1990
Men	51,194	55,615	60,000	62,903	65,220
Women	31,520	36,998	41,673	45,699	48,619
Total	82,714	92,613	101,673	108,602	113,839

Participation Rates (percentage)*

	Actual		Projected		
	1970	1975	1980	1985	1990
Men	79.3	77.8	77.8	77.5	77.3
Women	43.0	46.3	48.4	50.3	51.4
Total	60.0	61.2	62.3	63.2	63.6

Source: Howard N. Fullerton, Jr. and Paul O. Flaim, "New Labor Force Projections to 1990" *Monthly Labor Review* (December 1976): p. 4

*The participation rates for men and women represent the percentages employed in the labor force; therefore, the total participation rate for the entire population is not equal to the sum of the individual participation rates for men and women.

The BLS provides a variety of aggregations of its occupational projections. Some 23,000 occupational titles are aggregated into 411 occupational categories and these in turn are grouped into 12 major occupational groupings. However, the greatest use of these occupational projections extends from the application of detailed data in the 411 categories and in its refinement to geographic regions and individual states. Through an extensive outreach program, a host of derivative studies of occupational requirements is encouraged.

Because of their wide application, one must understand the methodology used in performing these occupational projections. The BLS begins with certain assumptions about the size of the labor force, the probable trends in federal economic policy, the rate of growth of the Gross National Product, and other economic forces in the economy (Bowman and Morlon 1976). Using "input/output" analysis, the projected GNP and labor force factors are "distributed" through the economy, resulting in projections of employment for 125 industries or industrial groups. Then, regression analysis is used to distribute these estimates to 200 industries. Finally, projections of employment by industry are translated into projections of employment by occupation, using an "industry-occupation" matrix that projects proportions of different occupations that will be employed in different industries. In this final stage, some allowances are made for changing occupational structures in different industries.

Projections of Educational Requirements—A rough notion of future "educational requirements" is achieved by combining occupational forecasts with an analysis of the proportions of different occupations that have historically required college degrees. Comparing these projections of "educational requirements" with NCES projections of the future supply of baccalaureate and graduate degrees, the BLS generates an approximation of the future supply-and-demand balance for college graduates. The most recent estimates suggest that over the 1974 to 1985 period, 950,000 surplus workers with college degrees will enter the labor force. This is a smaller surplus than the BLS predicted several years ago. While one may quarrel with the magnitude of the projected surplus, the nature of the competitive condition that will prevail is less debatable. The BLS contends that college graduates

> . . . will continue to have a competitive advantage in the job market over those with less education. Instead, problems for college graduates will likely center on underemployment and job dissatisfaction. . . . The prospective oversupply of college graduates is likely to have an adverse effect on those with less education. (Carey 1976, p. 20).

The current BLS projections (BLS 1976) of Ph.D.'s foretell a Ph.D. surplus in science and engineering significantly less substantial than was projected by the 1975 projections discussed later in this chapter (BLS 1975). The major reason is that recent NCES projections of future doctoral graduates have been tempered because of reaction by graduate students to the poor prospects for Ph.D. employment.

Applications of BLS Projections by Other Groups—As mentioned previously, the work of the BLS is relied on heavily in other forecasting efforts. In fact, a comprehensive study of state and local manpower projections conducted by a study group from the Center for Human Resource Research at Ohio State University discovered that nearly two-thirds of the state studies and an even greater proportion of the local studies that were scrutinized emerged from the BLS Cooperative Industry/Occupational Matrix Program (Kelley et al. 1975, p. 180). BLS data and methodologies also sustain most of the analytical and projection efforts in the states that rely on data bases supported by Employment Security Commission (ESC) and Comprehensive Employment Training Act (CETA) funds. A well-known application of BLS techniques to higher education is the supply-and-demand projection series for the southern states conducted by Richard Engel and Eva Galambos of the Southern Regional Education Board (1975, 1976).

Limitations of the BLS Projection Series—Due to their interrelated nature, similar shortcomings characterize all of the BLS projections and derivative studies. One pervasive limitation of these projections is their reliance on a "requirements" or "capacity" approach. These projections use trend extrapolation to estimate requirements for occupations independent of the "supply" of workers or, more importantly, independent of the interaction between supply and demand. Like all fixed-coefficient models, the BLS projections will be numerically inaccurate in the light of market adjustment.

Furthermore, a series of questionable assumptions also characterize these projections (Kelley et al., 1975). For example, the BLS projections seem implicitly to assume that government programs can affect only the supply of trained or educated manpower. On the contrary, government can also influence actual employment and demand for most occupations. Moreover, these forecasts assume that an individual can respond intelligently to occupational information without having some understanding of how others will respond to the same conditions. In reality, the effects of the educational and career decisions of other individuals must be evaluated. This is true whether that decision-maker is an individual, an institution, or a government. Another shortcoming arises from the assumption that occupations change

in an incremental manner, when they are often characterized by more abrupt changes. A final flaw concerns the data on which these projections depend. Some researchers feel that the BLS occupational classifications are inadequate to the needs of researchers. More importantly, adequate data simply have never been available on the relationship between training or education and ultimate employment. This inadequacy has handicapped all projection efforts.

Projections of Undergraduate Enrollments and Degrees Awarded

The pressures for an oversupply of college-educated workers and increased competition among the college educated that are projected by the BLS are quite plausible. But these projections fail to capture how students will change their behavior based on these conditions. Recent projections of undergraduate enrollments and degrees awarded have attempted to provide such insights by modifying initial projections of enrollment based on reactions to developing manpower imbalances.

Earlier discussion highlighted the evolution of enrollment forecasting beyond the trend-demographic approach that is the basis of the methodology used by the NCES. Some projections, such as the various series of the Carnegie Commission on Higher Education (1971, 1973), have introduced policy-conditional techniques that tie levels of enrollment to potential changes in educational policy at the institutional, state, or federal levels. More recently, forecasts have begun to look at the influence of economic conditions and the relative economic rewards of college going, in addition to demography and public policy. The efforts of Stephen Dresch and Richard Freeman have generated interest in this new approach.

Considerable disagreement exists concerning the extent to which the collegiate undergraduate is responsive to market conditions. Given our current imperfect understanding of the collective behavior of a diverse collegiate population, even those who include market adjustment factors in their projections differ in their views of the future. To capture a range of viewpoints, we have selected for comparison the projections of three researchers: Stephen Dresch, Richard Freeman, and Allan Cartter.

To some degree, these researchers differ in their reasons for projecting enrollments/degrees awarded, their basic assumptions, and their methodology. None of these studies considered numerical projections of enrollments or degrees awarded as their primary aim. Dresch's primary goal was to construct a model showing the effect of economic saturation on the college-educated component of the work force.

Trends in enrollment were one manifestation of the economic saturation and the declining economic rewards of college-going that his model predicted. Freeman's major interest was to demonstrate the effects of market factors in altering college attendance and how developing market conditions would alter the conventional view of future enrollments. Cartter's projections were part of a large-scale projection effort that focused on the prospects for academic employment of Ph.D. graduates. His projections of undergraduate enrollments and degrees awarded were merely one stage in his ultimate construction of a market-adjusting model for the employment of Ph.D.'s in academia.

The basic assumptions and methodologies of these different projections account for a major portion of the variance in their views of the future. Dresch assumed that degree-credit enrollments are attributable to demography and economics (with policy capable of playing an adjusting role). His model was based on the assumption that an "equilibrium level" for educated persons exists in the economy. Freeman also believed that enrollments were largely driven by demography and the economic rewards of education. While the basic assumptions of Dresch and Freeman are quite similar, their views of the future differ in their severity. The differences between the results of Dresch's simulation model and Freeman's three-equation "recursive[1] adjustment model" were due to differences in elements of the methodology. Without going into the details of these methodological differences, the variance in their results bears eloquent testimony to the fact that even projections with similar assumptions and related methodologies can yield results that vary videly.

Allan Cartter's projections were based on a basic assumption that stands in sharp contrast to those of Dresch and Freeman: he assumed that total undergraduate-degree-credit enrollment is relatively unresponsive to market conditions. As he stated it:

> Going to college has become the expectation of most youths and their parents over the last generation, and a college education can be considered to be the educational analogue of a "consumers good" in the general economy. That is to say, undergraduate education is "purchased" primarily for the enrichment of life in its intellectual, social, and cultural context and only secondarily as "investment" in marketable job skills. . . . Prospective job availability may significantly influence choice of major in college, but appears to have little impact on the decision of whether or not to attend college. (Cartter 1976, p. 73).

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[1]"Recursive" in this sense means sequential, Freeman's model consisting of three sequential equations.

For undergraduates, Cartter used fixed coefficient modeling that projected enrollments using trends in demography, high school graduation, and college attendance. On the other hand, he believed that total graduate enrollment is highly responsive to economic rewards, and applied a market adjustment model in projecting graduate enrollments and the employment of Ph.D.'s in academe. In actuality, Cartter produced a range of projections reflecting possible alternate futures, from which we have chosen his "most likely" projection.

Differing views of the future emerge from these projections. The greatest variation exists between the projections of Dresch and Cartter. Dresch's economic saturation model foretells a continuing increase in prebaccalaureate enrollments through 1980, but a stunning decline of 45.8 percent between 1980 to 1990, and a further decline of 11.9 percent between 1990 to 2000. The net result would be an enrollment level in the year 2000 that would be 32.7 percent lower than the enrollment level in 1970. Cartter's projection, on the other hand, predicts continuing growth until 1980 (although at a lesser rate than foreseen by Dresch), a modest decline of 5.7 percent in the eighties, and a very modest rate of growth of 3.2 percent in the nineties. Cartter's projection of undergraduate enrollment in the year 2000 is 19.9 percent greater than actual enrollment in 1970.

Freeman's primary interest was not in providing hard numerical projections of future enrollments, although his model provides that capability. Rather, he focuses on describing market rewards that will exist for college graduates, how these rewards will influence college-going, and how these influences will alter the conventional projections of future enrollments. Freeman's projections separate the market prospects for men and women. He forecasts that the starting salary of male college graduates, relative to the earnings of all full-time workers, will continue to decline until 1977-79 but will rise again in the eighties. In response to this upswing and the smaller number of people of college age, the ratio of 18- to 19-year-old males enrolling in college, which has been declining since the late sixties, will bottom out between 1973 and 1977, begin to rise in the late seventies, and continue throughout the eighties. This increase in attendance rate will provide a hedge against the numerically small college-age population during this period. The proportion of the work force that is college educated will continue to increase at a relatively substantial rate to the nineties, and then will increase at a lesser pace.

Based on these projections, Freeman believes that the enrollment declines estimated from demographic patterns for the eighties will occur earlier, during the late seventies. As a result, the smaller college

cohort population of the eighties will enjoy larger economic rewards. Attendance rates will increase, and the declines projected by other forecasts will be diminished; however, the economic incentives to attend college will not reach their sixties levels. Moreover, the relative economic position of older graduates who received their degrees in the seventies may continue to weaken.

All of these forecasts must be viewed as tentative and imperfect views of the future. While one can probably dismiss Dresch's view as being too extreme, one must qualify the views of those other educators who hypothesize that it might well be possible for advances in lifelong learning to double the size of the learning force by the year 2000 (Bowen 1975). In reality, it takes so many part-time or intermittent learners to equal fulltime, traditional undergraduate students that the impact of such people will probably be insufficient to overcome the declines in full-time traditional learners. Moreover, some of the institutions that are most anticipating the windfall from these students are the ones that have the least to offer by virtue of their location or program offerings.

The most valuable insights provided by these projections are not their problematic numerical outcomes but their view of the condition of economic life for college graduates over the next several decades. Economic rewards of education will fluctuate but will at no time approach those of the halcyon days of the sixties. Underemployment and latent job dissatisfaction may be rampant. On the other hand, the college-educated person should still have an advantage in competing for jobs with the less-educated. The holder of a high school diploma and someone with subassociate degree training are those most likely to suffer the greatest personal economic losses in such a market environment.

The Labor Market for Ph.D.'s

The labor market for Ph.D.'s has been the portion of the academic market that traditionally enjoyed the greatest attention. Graduates holding Ph.D.'s have always been sufficiently specialized that career tracks have been easy to trace. When an atmosphere of Ph.D. shortage captured the popular imagination during the fifties and sixties, an important element of national policy was to produce more and more holders of doctoral degrees. As already discussed, the response of American higher education and students to the social and economic rewards of graduate study replaced the forecasts of shortages with the reality of impending oversupply.

Since the early seventies, forecasts of Ph.D. supply and demand have reflected this new reality. Two recent projection series by the Bureau of Labor Statistics *(Ph.D. Manpower: Employment, Demand and Supply 1972-85)*, and the National Science Foundation *(Projection of Science and Engineering Doctorate Supply and Utilization)* have received a great deal of attention and will be compared. Both series projected the 1972 to 1985 period and were published in 1975.

Projections of Ph.D.'s in science and engineering should not be taken to represent all of graduate education. The BLS series includes all Ph.D. fields in its surveys, even though we shall focus on their projections for science and engineering. Moreover, the master's degree continues to be an important and growing graduate credential. Many professionals are coming to view the master's degree, or a refurbished, expanded bachelor's degree, as the necessary credential of first professional placement, rather than the traditional baccalaureate. But it is difficult in some cases to separate "real" master's degrees from "terminal" master's degrees awarded to persons unable successfully to complete the doctorate. These problems make it more appropriate for our purposes to compare projections of the Ph.D. labor market.

Table 2 contrasts the projections of Ph.D. supply, demand, and surplus of both NSF and BLS. Under the BLS projection, 36.6 percent of the total science/engineering Ph.D.'s in existence in the work force in 1985 will be "surplus." The NSF study predicts a 21.8 percent surplus. What is even more striking is the fact that the NSF and BLS vary substantially in their individual projections of supply and demand. Perhaps the most graphic divergence exists in the Life Sciences, where the NSF augurs a surplus of only 7,100 Ph.D.'s as contrasted with the BLS prophecy of a surplus of 64,000. These projected surpluses represent 7.7 and 46.9 percent, respectively, of the total projected supply of Ph.D. Life Scientists.

While Table 2 compares the total supply and demand for all Ph.D. graduates, it is more meaningful to examine the incremental supply and demand for new Ph.D.'s who will enter the labor market between 1972 and 1985. Discrepancies of an even more dramatic nature emerge when one compares these prospects for new Ph.D.'s as seen by the two studies. While their net estimate of new openings for Ph.D.'s is very similar, the BLS projection of new Ph.D.'s entering the labor market between 1972 and 1985 exceeds that of the NSF by over 100,000 graduates. This results in a projected oversupply more than double the NSF's projected imbalance.

*Table 2. Comparisons by the National Science Foundation and the Bureau of Labor Statistics of Employment Prospects of Ph.D.'s in 1985**

	Number of Ph.D.'s							
	National Science Foundation**				Bureau of Labor Statistics			
Field	Supply	Demand	Surplus	% Surplus	Supply	Demand	Supply	% Surplus
Physical Sciences	85,200	76,000	9,200	10.8	118,700	91,700	27,000	22.7
Engineering	63,300	45,000	18,300	28.9	80,100	59,100	21,000	26.2
Mathematics	21,600	16,000	5,600	25.9	31,400	19,800	11,600	36.9
Life Sciences	92,100	85,000	7,100	7.7	137,700	73,100	64,600	46.9
Social Sciences	112,700	71,000	41,700	37.0	153,700	87,100	66,600	43.3
Total, Service and Engineering	374,900	293,000	81,900	21.8	521,600	330,800	190,800	36.6

*National Science Foundation. *Projections of Science and Engineering Doctorals Supply and Utilization*. Washington, D.C.: U.S. Government Printing Office, 1976, p. 16, 22. Bureau of Labor Statistics. *Ph.D. Manpower: Employment, Demand, and Supply 1972-85*. Washington, D.C.: U.S. Government Printing Office, 1975, p. 11.

**Used NSF "probable model"

Table 3. Projected Supply and Demand for Ph.D.'s Entering the Labor Market, 1972-1985•

	BLS	NSF
Requirements for New Ph.D.'s (Expansion, Enrichment, or Replacement)	135,500	140,500
New Supply of Ph.D.'s (Graduates Minus Net Migration)	326,200	218,500
Net Oversupply	190,700	78,000

•Based on information contained in the following sources: National Science Foundation. *Projections of Science and Engineering Doctorals Supply and Utilization.* Washington, D.C.: U.S. Government Printing Office, 1976, pp. 16, 22; and Bureau of Labor Statistics. *Ph.D. Manpower: Employment, Demand, and Supply 1972-85.* Washington, D.C.; U.S. Government Printing Office, 1975, p. 11.

Why do these projections differ so dramatically? On the supply side, where most of the discrepancy occurs, the major reason for the difference lies in the choice of projections of degrees awarded. The BLS used 1973 NCES projections that were based on untimely data that did not reflect the decline in the growth rate of graduate enrollments that had already occurred in the seventies. The NSF developed its own model based on a 12-year data series. They attached double weights to the data of the past five years, thus capturing to some degree the effects of the diminishing rates of growth (Kolala 1976). In all fairness to the BLS, their most recent projection has significantly reduced the estimated supply and demand imbalance by using more current NCES projections (Carey 1976; BLS 1976).

While the incremental projections of new total demand (Table 3) were quite similar for both projection series, this does not mean that they portray the same future. As Table 4 reveals, most of the new demand foreseen by BLS was attributable to expansion, based on their optimistic projection of enrollments. In the light of more reasonable figures, this projection of demand due to expansion can be expected to decline. On the other hand, the NSF projection estimated that enrichment—the "upgrading" of engineering and science positions to employ Ph.D. graduates—would account for much of the new demand, and replacement would account for the second largest portion. Expansion would create several thousand jobs, but all would be in nonacademic settings.

The sector of the labor market into which these new Ph.D.'s enter

is also important. The BLS predicts that over half of the new openings between 1972 and 1985 will be in educational institutions. In light of the overoptimistic enrollment forecasts on which this is based, one questions this outcome. The NSF view is less sanguine: slightly more than 40 percent of all new openings in scientific and engineering employment will be in academic institutions, with the remainder being in nonacademic research and development and in "other" scientific and engineering employment. Within academe, all of the new Ph.D.'s will be hired because of enrichment or replacement; the net expansion demand will be negative. Moreover, 78,000 of the total Ph.D.'s entering the work force during this time will be in *nonscientific* employment. When we include these persons in the figure for total new Ph.D. employment, less than 30 percent of the new Ph.D.'s entering the work force between 1972 and 1985 will be employed in academic institutions, according to the NSF projection.

The NSF and BLS projections are essentially fixed-coefficient models, even though they incorporate some market adjustment factors, such as enrichment in the face of oversupply. Both agencies acknowledge that the future will not reflect their projections with any precision due to market adjustments. It should be noted that NSF is in the process of developing a market adjustment model but did not apply it in this study because of the paucity of data. Future NSF modeling efforts will no doubt incorporate this new approach.

*Table 4. Sources of Demand for New Ph.D.'s in Engineering and Science, 1972-1985**

	BLS	NSF
Enrichment	24,800	85,000
Expansion	80,600	1,000
Replacement	30,100	54,000
Total**	135,500	141,000

*Based on information contained in the following sources: National Science Foundation. *Projections of Science and Engineering Doctorals Supply and Utilization*. Washington, D.C. U.S. Government Printing Office, 1976, pp. 16, 22; and Bureau of Labor Statistics. *Ph.D. Manpower: Employment, Demand, and Supply 1972-85*. Washington, D.C.; U.S. Government Printing Office, 1975, p. 11.

**The NSF figures have been rounded and do not sum to total; consequently, this total does not correspond to that of Table 3.

The most recent BLS projection of supply and demand imbalance (1976) is far more reasonable than the 1975 series. Nevertheless, we compared NSF and BLS series that were published at comparable times to demonstrate the care that must be taken in choosing between projections. In some ways it is wholesome to have competing views of the future. For its part, the BLS feels that the NSF's view of the future serves the educational community too well by including substantial enrichment effects in its projection of demand (Kolala 1976). On the other hand, the BLS series suffers from the need to regularly generate routine data and projections, often at the expense of new techniques.

Ph.D.'s in Academia

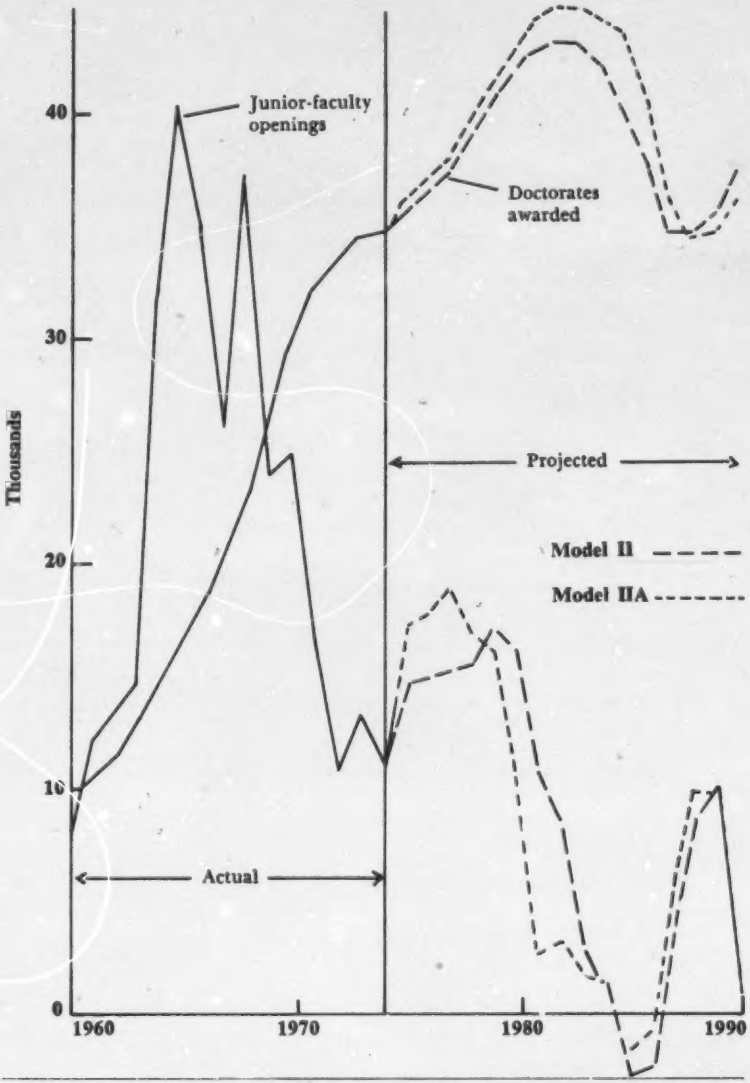
The prospects of an extremely depressed market for Ph.D.'s in academic employment have been forecast by Allan Cartter for nearly a decade. Over the years, Cartter has furnished an increasingly sophisticated series of projections that focused on the impact of the declining market for Ph.D. graduates in academic institutions. The most graphic relationship that has emerged from each successive projection was a consistent decline in Ph.D.'s required through the late seventies and the mid-eighties, followed by a slight recovery in the late nineties. The extent of the decline in the mid-eighties was so severe that a negative demand for Ph.D. graduates in academia was foreseen. Depending on which of the variety of alternate projections was used, each reflecting different policy asumptions, this negative annual demand ranged from under 1,000 Ph.D.'s to over 10,000 (Cartter 1974).

In his last book, *Ph.D.'s and the Academic Labor Market (1976)*, Cartter introduced a market-responsive component to the projection models. Cartter assumed that the decision to enroll as an undergraduate was not guided by market factors, but that graduate enrollments and degrees awarded were highly market-responsive (choice of major might be market related but not the decision to enroll). Cartter applied market-response components to graduate enrollments and faculty employment to reflect the impact of the dismal market for Ph.D.'s in colleges and universities.

There were five stages to Cartter's approach. In the first three stages, he projected undergraduate, graduate, and total enrollments and the demand for college and university faculty using a variety of fixed-coefficient techniques. The result of these projections was similar to previous Cartter projections: substantial declines in academic demands for new Ph.D.'s and a developing negative demand for new faculty in the eighties.

In the fourth stage, Cartter introduced several market-response

Figure 1. Market-Response Model Projection of Doctorates Awarded and Junior-Faculty Openings



From *Ph.D.'s and the Academic Labor Market*, by Allan M. Cartter. New York: McGraw-Hill, 1976, p. 149. Used with permission of McGraw-Hill Book Company.

effects. The fixed-coefficient projections of graduate enrollments and degrees awarded were altered to reflect student adjustment to projected conditions. Then the fixed-coefficient projection of new faculty openings was modified to mirror the new enrollment conditions. Both the fixed-coefficient (Model II) and market-responsive (Model IIA) projections are portrayed in Figure 1. The major effects of the response were to increase the demand for faculty in the 1975-77 period, hasten the decline in demand previously forecast for the eighties, and modestly strengthen the demand for faculty in the eighties. However, a condition of "negative demand" is still seen to exist in the mid-eighties.

In the fifth stage, Cartter introduced a more extreme market adjustment mechanism. In his view, the depressed academic labor market could be counted on to cause several changes in faculty behavior. First, decreasing relative economic rewards would cause faculty who had the opportunity to pursue more lucrative employment prospects in industry and government. Cartter estimated the resulting net outmigration of faculty would be 1 percent per year. Second, the rate of promotion to tenure would decline from about 20 percent to 10 percent. Third, early retirement would be invoked in many institutions. The net result of these adjustments would be to add 5,000 to 7,000 new faculty positions per year to the demand for new faculty in the eighties that is portrayed in Figure 1.

Rather than ascribing great accuracy to these figures, it is most instructive to examine the general view of the academic labor market that emerges for the eighties. Table 5 summarizes the general conditions. The number of new junior faculty positions will decline from an average annual demand for 27,000 new faculty during the 1962 to 1972 period to less than 10,000 per year between 1982 and 1992. While over 50 percent of the new Ph.D. graduates since World War II have been employed in colleges and universities, less than 20 percent of the new Ph.D.'s will be so employed by the eighties—and this many only if severe market adjustment occurs. In this regard, the views of NSF and Cartter are very similar.

Subgroups of the Total Labor Market

Every group within the labor force does not share equally in the relatively gloomy prospects for baccalaureate and doctoral graduates. Indeed, shortages in certain key professions will recurrently appear, in all probability, at the same time that the labor market as a whole is confronted with an oversupply of educated manpower. For example,

the relative prospects for women and minorities are likely to be somewhat brighter than those for white males. In addition, certain professions with identifiable career tracks and whose fortunes are keenly followed by the public, e.g., engineering, law and medicine, may exhibit trends running counter to the labor market in general. The purpose of scrutinizing these subsets of the labor force is to determine the nature of the particular market fluctuations that can be expected within our overall view of the future.

Table 5. Summary of Final Conclusions of Cartter's Projections

Conclusion	Description
The academic labor market will be highly depressed.	Relative salaries will tend to be lower. Net out-migration will approach 1 percent per year as faculty with opportunities seek more lucrative positions in industry and government.
Institutional reactions may ameliorate the situation.	Mandatory retirement age will be scaled downward. Rate of promotion to tenure will shrink from 20 percent to 10 percent.
Administration/faculty relations may suffer.	Deteriorating market conditions will strengthen the role of administration. Increased collective bargaining by faculty is highly likely.
Number of junior faculty positions will decline.	1962-72 Average annual hiring of junior faculty is 27,000. 1972-82 Shrinks to 16,000 per year. 1982-92 Collapses to less than 10,000. In some years the expansion will actually be negative, but replacement needs will offset this decline.
Employment of new Ph.D.'s in nonacademic employment will increase.	In most years since World War II, academic employment has accounted for over half of any year's Ph.D. graduates. Over the next few years, the demand in academe will be less than 35 percent. In the eighties, 20 percent or less of new Ph.D.'s will be hired in academe, and then only if severe market adjustment occurs.

Source: Compiled from Allan M. Cartter. *Ph.D.'s and the Academic Labor Market*, New York: McGraw-Hill, 1976.

The Market for Women Graduates

Over the years, women have exhibited different college-going characteristics than men, especially in their propensity to go to college, choice of major, work after graduation, average income, and promotional possibilities. Socialization, discrimination, and different roles of the working woman have been offered as explanations for these traditional differences. Regardless of one's perspective on the reasons for these differences, several trends emerge from studying the facts and figures of the past decade: women are more likely to attend college; their selection of field of study is changing; and the likelihood of their working after graduation, their relative average incomes, and their promotional possibilities are all increasing, although not uniformly.

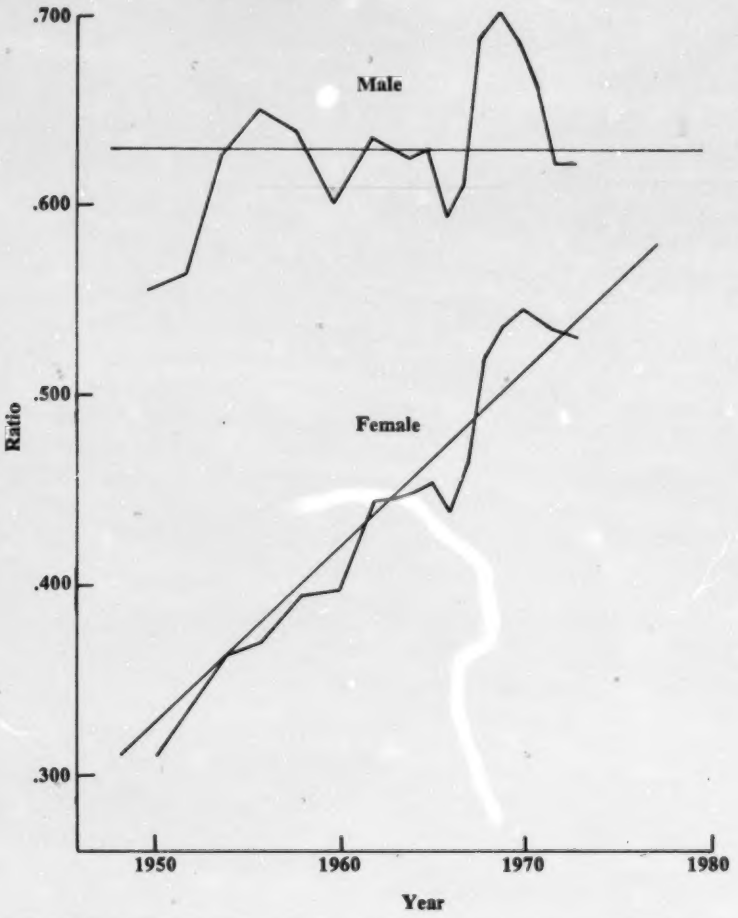
Figure 2 charts the percentage of men and women high school graduates who enter college. Clearly, the percentage for women has been increasing consistently, and is approaching the ratio for men (by Cartter's calculation, parity would occur in 1983 if long-term trends continue). Moreover, women are breaking out of their "disciplinary ghettos" and are more likely to enter traditionally male fields. The relative propensity of freshmen women to enter business, medicine, law, and engineering more than doubled between 1966 and 1974 (Freeman 1976, p. 178). The trend is continuing with even greater strength today (Scientific Manpower Commission 1977).

The average salary for college-educated women still lags behind that for college-educated men, although the gap is narrowing. Bayer and Astin (1975) calculated the difference in academia to be roughly 20 percent. Correcting for characteristics and credentials significantly reduced but did not eliminate the difference. Recent studies have suggested, however, that discrimination against women in first job placement for new Ph.D.'s in academia has been virtually eliminated (Cartter and Ruhter 1975).

It remains to be seen whether these gains will continue. Women fared better than men in the job market of the seventies and moved into traditionally male fields. However, Richard Freeman believes that future progress will be problematic. As the market for school teachers declines even further in the seventies and eighties, the market for college women will suffer downward pressure that may or may not be overcome by the continued movement into traditionally male fields. Freeman believes there is insufficient experience with the demand for female graduates to make a definitive judgment. While women students have tended to be more oriented toward occupational/monetary rewards than men, the current generation of women

students is being motivated by strong social and cultural goals. Even if the relative economic rewards from education for women begin to decline, women may still chose college as a chance for breaking away from stereotyped roles (Freeman 1976).

Figure 2. Ratio of College Entrants to High-Graduates: By Sex, 1950-1973



From *Ph.D.'s and the Academic Labor Market*, by Allan M. Cartter, New York: McGraw-Hill, 1976, p. 53. Used with permission of McGraw-Hill Book Company.

The Prospects for Minorities

Traditional discrimination against blacks had resulted in substantial salary discrepancies between whites and blacks having similar levels of education. During the sixties and early seventies, however, discrimination declined substantially. According to Richard Freeman's analysis of the empirical evidence:

> 1. Discrimination against black graduates declined drastically, with black female graduates attaining rough economic equality with white female graduates by the mid-1960's and young black male graduates attaining equality in the late 1960's. However, while older black men made economic advances relative to comparable whites, they continued to trail their white peers — the legacy of past discrimination.
>
> 2. Black youngsters and qualified personnel responded with extraordinary speed to the changed market situation, with the young enrolling in college and altering occupational plans rapidly in accordance with new economic opportunities. Perhaps because of generally low family incomes, black youngsters appear more attuned to monetary incentives than whites.
>
> 3. The economic gains of educated blacks were not reversed by the falling job market. To the contrary, black college workers either maintained past or enjoyed continued advancement relative to whites in the depressed 1970's (Freeman 1976, pp. 138-39).

This is not to say that these conditions are immutable. Freeman identifies four potential problem areas: (1) many of the advances in black employment are in positions related to the black community, and future gains may be limited; (2) parity in starting jobs does not guarantee parity in promotions in the future; (3) if the government weakens pressure for affirmative action, the condition of black graduates may erode; (4) the increased competition in a depressed market from highly educated white graduates with more privileged backgrounds may limit future gains by blacks (Freeman 1976, pp. 156-7). Nevertheless, Freeman posits that the relative market advantage of black over white men that he identified is likely to continue.

The Varying Fortunes of Different Disciplines and Professions

Not all disciplines and professions will face the extreme condition of oversupply that most forecasts project for the future. In general, academic disciplines that have attractive opportunities outside of academe, such as science and engineering, will be relatively advantaged. The humanities and social sciences, on the other hand, will be especially hard pressed. The attendant "aging" of the faculty and "tenuring-in" that will occur will have deleterious effects on these

disciplines in particular, but few disciplines will escape unscathed. Even in disciplines that are relatively well-off, particular campuses may experience special problems owing to their unique circumstances.

In addition to Ph.D.'s in engineering and science, baccalaureates in engineering are a group whose job prospects are of considerable interest to the public. Engineering is likely to be one of the fields with the best long-term prospects, but its graduates will not enjoy continual market advantages over the next few decades. The reason is that engineering has long been a classic example of a profession exhibiting cobweb effects. As discussed earlier, good market conditions for engineers lure inordinately large numbers of students who graduate four years later to less favorable market conditions. Freeman's fitted model of this cobweb behavior (Freeman 1976, p. 114) captures the upturn in engineering enrollments that occurred in 1973-74, and predicts that the current increase will continue until 1979, when another downturn will occur. If too many students change to engineering, as they appear to be doing on some campuses, the peak may come sooner.

Several caveats need be interjected into the discussion of the manpower conditions for engineers and scientists. A major national research initiative, such as energy, would probably confront shortages of the necessary technological manpower for a time, and might create eventual oversupplies if not handled sagaciously (Cartter 1976; Freeman 1976). Also, persons seeking scientific employment may face "a crisis of unmet expectations" if their view of appropriate scientific employment is too high or if they have become so specialized as to limit their capability to switch fields or specialties (Vetter 1977).

Law is another profession that appears to exhibit cyclical behavior. The interest in law school has waxed and waned in response to market factors and the general attractiveness of law as a profession (Freeman 1976, p. 128-9). The current law school classes of record proportions are depressing the market for graduates. While the relative economic rewards from the study of law may decline, enrollments may not decline commensurately. One reason is that law is being chosen as a new career by many liberal arts graduates whose economic prospects are even more depressing.

Medicine, like law, has experienced a boom in popularity as a field for graduate study in the seventies. To some extent this movement was enhanced by the declining results from graduate study in the sciences and the resultant exodus to medicine of top-quality students who would have entered Ph.D. programs in the sciences in

the sixties (Freeman 1976). Limitations on the number of medical school graduates has also played a significant role in maintaining the economic rewards of a career in medicine. This trend is likely to continue, barring concerted federal action. However, the modest decline in applications for last year's openings in American medical schools may signal a lessening of the lure of medical education (Fields 1977).

Improving the Use of Manpower Studies

The foregoing discussion of the development of manpower approaches in American postsecondary education suggests that they hold the promise for improved decision- and policy-making. However, manpower studies that are improperly applied harbor great perils as well. To wisely use manpower information and manpower projections, one must appreciate their very real limitations and the uses for which they are most appropriate. Further improvements in manpower techniques and research, some of which are currently underway, promise both to improve our ability to use manpower studies and to define more clearly their limits of applicability.

The Limitations of Manpower Studies

Most criticisms of the application of manpower approaches to higher education are based on some variation of the argument that students are primarily motivated to attend college by noneconomic forces. For example, Wood and Wilson (1975) represent this line of argument by citing several purportedly fallacious assumptions of "market" or "manpower" models in education. Manpower approaches assume: (1) that the primary reason for college attendance is preparation for a job; (2) that people make career choices primarily on the basis of job availability; (3) that the career choices of adolescents are sufficiently stable to enable career planning; (4) that adequate, reliable information exists for occupational decisions; and (5) that higher education has not been responsive to market changes. Wood and Wilson provide research evidence in support of the counterarguments that preparation for employment has not been students' primary motivation in attending college and that vocationalism decreases with exposure to higher education; that job availability is not the primary basis for career selection; that career choices of young people are highly unstable; that occupational information has been both sketchy and inaccurate; and that colleges and universities have been very responsive in their course and career offering to the needs of students and to changing market conditions. It could be argued in rebuttal that much of Wood and Wilson's highly persuasive line of reasoning is based on data from periods in which economic conditions were more favorable than today. Nevertheless, it is clear that certain tenets of student economic behavior are grounds for vigorous debate.

Regardless of one's position on this issue, it is incontrovertible that a better understanding is needed of why and how students make choices concerning their education. Manpower researchers such as Breneman, Cartter, Freeman, and Kelley and the National Science Foundation Conference on Manpower Projections have reiterated the need for a better understanding of "student collective choice behavior." We need to know just how responsive students are to economic, social, cultural and other factors in making their educational decisions. Given the changing economic rewards of education, we cannot rely on studies performed a decade ago; we need to understand student behavior under today's market conditions and those that will exist over the next decades.

Numerical Accuracy and Technical Limitations

The previous chapters have provided ample proof of the inaccuracy of many past efforts at manpower projections. It is too soon to say with assurance that market-responsive models will be substantially more accurate than fixed-coefficient models, although that is the opinion of most manpower researchers. In general, we believe that current manpower projection techniques, especially the emerging market-responsive models, provide a general appraisal of the future academic market conditions that can be accepted with reasonable confidence. However, the details of even the most sophisticated models can be expected to be in error because of the effects of unforeseen developments.

The fact is we do not really know how accurate these models can become nor how many years ahead they will ultimately permit us to forecast accurately. Researchers with experience in applying these models are generally forthright in proclaiming their limitations, but not so pessimistic as to discourage their usage.

In their evaluation of ten case studies of the use of manpower studies in nine countries, Ahamad and Blaug found that many of the past studies had been inaccurate as instruments for influencing policy:

> . . . we are therefore driven to the central conclusion that manpower forecasting has not so far proved to be particularly useful for educational decision making; we may even go so far as to say that it has on occasion been positively misleading (Ahamad and Blaug 1973, p. 322).

In fairness to manpower projections, Ahamad and Blaug's review did not include many of the recent advances in manpower tech-

niques. Nevertheless, their conclusions seem reasonable. It is their ultimate conclusion that the limitations of manpower projections suggest that fairly accurate projections can only be made over relatively short periods of time, say two or three years. This timeframe is appropriate for an "active" manpower policy in which government regularly and aggressively intervenes in the labor market. Such short-term fine tuning by government should be limited to the occupational side of the manpower continuum, where a one- or two-year lead time for degree or certificate completion is consistent with the two- or three-year "accuracy horizon" of manpower studies. Such short-term studies should be revised often. This is not to suggest that manpower information and projections are not useful for the higher education end of the manpower continuum. Rather, it suggests a different approach congruent with the capabilities of manpower studies and the needs of higher education.

Appropriate Use of Manpower Studies in Higher Education

Freeman and Breneman (1974) delineate three often-recommended uses of manpower studies that are *inappropriate* for higher education. In their view, it is fallacious to use manpower studies to guide a manpower planning system based on the assumption that market adjustment in education is ineffectual. In reality, student reactions to market adjustment seem to be very efficient in altering student choice. The second spurious application results from assuming that manpower studies will be a substantial boon to career guidance counselors. In the past students have relied much more heavily on personal and informal sources for career decisions; moreover, the lead time for high-level career decisions discourages such counseling. While the evidence on the efficacy of career counseling using manpower projections is mixed, resolving this issue is very important in view of the emphasis that many manpower information systems are placing on improved career counseling. The third mistaken application of manpower studies is in collegiate course planning. In reality, colleges and universities are highly adaptable to changing needs. Indeed, this sort of evolutionary change in course offerings and areas of specialization is the major instrument for changing academic disciplines.

On the other hand, Freeman and Breneman specify three highly appropriate uses for manpower approaches that are congruent with the market environment, the lead time for career decisions in higher education, and the characteristics of manpower techniques.

• Manpower forecasts are useful as a tool for evaluating government policies. They can suggest where government action is needed, and *policy-conditional forecasts* can be used to demonstrate the potential impacts of governmental policy.

• A second attractive use is as an early warning system for market adjustment processes. This is especially important in such areas as the market for Ph.D.'s, where *cobweb effects* are present. Another such area is where *incomplete market adjustments* can be predicted. Knowledge of these adjustment processes can assist both individual and government action.

• The third use of manpower studies is as an informational or diagnostic device to direct attention to the market problems that are beyond the purview of individual decision-makers. Demographic changes, the impact of changing student choice in response to market factors, and the changing reward climate in academia are examples of where manpower studies can provide invaluable information to individual decision-makers.

Manpower projections can serve the very important function of alerting educators to second- and third-order problems that will result from projected market conditions. For example, problems arising from static faculties offering meager opportunities for junior faculty members and increased pressures for faculty collective bargaining are conditions that have major implications for educators. Anticipation of these conditions may enable institutions to act early to increase their flexibility in dealing with these conditions before they become chronic. Since flexibility promises to be a very rare commodity in the years ahead, this capability may be quite valuable.

The Role of State and Federal Government

Manpower projections serve as an important adjunct to the *manpower and occupational information* that is available for individual and institutional decision-making. It must be understood, however, that even current manpower information cannot be used properly by individuals without some notion of how other individuals will be reacting to market conditions. It is especially important that state and federal governments appreciate this fact as they design manpower programs for education and contemplate comprehensive manpower information systems.

Governments must understand the limitations of manpower studies in deciding on appropriate manpower programs. All too often, the temptation is great to use the best information available at the moment, realizing that it is flawed but that decisions must be made.

Using manpower information without appreciating its limitations could worsen, not improve, the difficult manpower conditions of the next decade.

Centralized, comprehensive national manpower planning at this time is a creature of limited promise and great dangers because we simply do not have the capability to plan with sufficient accuracy to make such an activity worthwhile, nor are we certain of developing such capacities. This does not mean that there is no need for national manpower information. Indeed, the support of decentralized decision-making requires not only a national data base but comprehensive structures for accommodating the data to regional and state conditions.

A number of appropriate roles for state and federal governments emerge. The short lead-times for degree/certificate completion, the capability of performing reasonably accurate projections up to two or three years into the future, and other factors suggest that state and federal governments should take an active role in fine tuning occupational markets. Such interventions can influence both supply, by dealing with education and training, and demand, through the encouragement of certain forms of economic growth, employment, and research.

The longer lead-times for degree completion, the more complicated career tracks, and the limited capabilities of manpower techniques do not suggest a similar approach for the higher education portion of the labor market. Governmental attempts to fine tune the market for highly educated manpower are to be discouraged (Breneman 1975; Cartter 1976). Indeed, the role of government in the past has served to destabilize the market conditions in academia by accentuating, rather than dampening, ongoing market adjustments (Cartter 1976). A prime example is the acceleration of the rate of Ph.D. production in the sixties and the precipitate removal of certain types of grant support in the seventies. The uncertain nature of future events and our imperfect capacities to forecast the future suggest that rapidly changing governmental initiatives may be dysfunctional. Rather, "maintaining a strong and flexible system of education will always be our best form of insurance" (Breneman 1975, p. 135) against future uncertainties.

It is suggested, therefore, that government action is most desirable in fostering long-term educational goals. Manpower studies will be very helpful in this regard in charting the general dimensions of the future and estimating the impact of long-term federal policies. The challenges of preparing for the declining academic market condi-

tions of the eighties must be met today. Also, higher education must prepare for challenges of great magnitude, such as the need to produce larger numbers of highly trained manpower to deal with the energy crisis. This potential windfall should not be viewed, as it is by some, as an excuse for ignoring the unattractive aspects of the market for most highly educated manpower. Rather, the decision to focus national resources on energy may require careful but active government and institutional interventions to increase the number of energy scientists and related professionals without creating a surplus of substantial proportions some twenty years in the future.

The Role of Educational Institutions

Educational institutions must be prepared to use manpower studies wisely. While there is probably no way for government or institutions to avoid the severe market adjustments that will occur over the next decade without causing other, equally undesirable consequences, institutions can prepare for the future with today's decisions. Where appropriate, closer connections between education and the world of work could help accommodate changing conditions. The recent dedication of the Annual Conference of the American Association for Higher Education to this theme indicates the level of interest in this approach. More comprehensive and realistic career counseling in higher education holds promise. It is especially important to overcome the view that a college degree is a guarantee of a better job; there is every indication that today's students are quickly becoming disabused of that notion. Preparing graduate students for careers in nonacademic settings is another means of preparing for the future, although it is unclear how best to achieve that aim. Finally, institutions can anticipate the staffing problems of the eighties by examining early retirement for faculty and means of injecting new life into disciplines that are heavily staffed with tenured faculty.

None of these approaches are panaceas. At best they will lessen the pressures in what promises to be a difficult period of adjustment. To bring about these adjustments while maintaining the strength and flexibility of higher education, both government and the educational community must recognize that the market imbalances and adjustments of the next decade will be necessary; however, if educational institutions do not assume an active role in addressing these problems, there is every indication that state and federal governments will take the lead.

Through the present time, the federal government has not substantially reconsidered its support of increased educational opportunity and free student choice. The federal and state governments have questioned the wisdom of students pursuing fields of study experiencing a surplus of graduates, such as the humanities, education, and some scientific fields, and support of these areas has been discouraged. But there are indications that state and federal governments may come to reconsider their basic commitment to universal higher education in the light of market developments.

In the *Social Limits to Growth,* Hirsch (1976) describes how our educational system, even more than stimulating competition for material goods, fosters competition for "positional" goods. Students go to college to compete for society's choice, intrinsically rewarding jobs. Since there are not enough of these jobs to go around, graduates experience underemployment and frustrated expectations. But students must continue to go to college if they wish to be in the running for these positions, even if their chances of success are slim and relative economic rewards decline. This approach questions whether a student's decision to enroll in college is highly market-responsive. More importantly, it suggests that as positional competition and underemployment become even more intense over the next decade, the federal government may be forced to question whether the "overeducated American" is a reality. Clearly, manpower and marketplace issues will play a key role in the debate.

Areas for Improving Manpower Studies

In order to forestall inappropriate decisions based on misconceptions about the market for educated manpower, it is necessary to improve the quality of manpower information and techniques. This is not to say that more research is a cure-all for the ills of manpower studies. Rather, we must recognize that our current knowledge of the market for highly educated manpower is limited. To improve this knowledge and the quality of manpower decisions, the development of market-responsive manpower modeling must be continued, the educational/occupational data base must be improved, closer interaction between different groups of forecasters must be encouraged, and there should be more complete integration of the occupational and higher education segments of the manpower continuum.

Improving Market Responsive Models—The community of manpower researchers is in near-unanimous agreement on the need to increase our capability to make market-responsive projections of

supply and demand for educated manpower. Such techniques will increase the accuracy of the projections, although a wide confidence interval should always be placed around any projection. However, these developments are not without their shortcomings. As projection techniques become more complex and as their assumptions become more sophisticated, the user finds it more difficult to understand the resulting projections. Most educational decision-makers are understandably loathe to accept without question numbers that are generated by a black-box model whose workings are beyond their ken. When different modeling approaches produce disparate numerical outcomes, it is difficult to choose between models if the basic assumptions are shrouded in complex techniques.

Most manpower researchers feel that the potential for increased accuracy of these models is worth the price. In the future, greater care must be taken to make the basic assumptions and methodologies of increasingly complex projections understandable to users. It is clear, however, that the greatest potential for improving market-responsive models lies not in the area of projection techniques but in the data base that enables us to gauge the reactions of students to economic and other conditions.

Improvements in the Data Base—The data base on the academic labor market is much in need of improvement. While national data bases have improved significantly from the sixties, when major projection errors were caused by the poor quality of data on faculty, our knowledge is still too scanty. A number of specific needs are apparent. We need more comprehensive information on the faculty career patterns and mobility of recent years. In the same vein, we must begin to determine the responsiveness of faculty to market factors. This information will become increasingly important, since positions for junior faculty in the near future may be dependent on the propensity of senior faculty to seek more lucrative positions in industry and government. Finally, we need to develop an understanding of the "coefficient of substitution" for highly trained scientists and academicians; that is, we need to determine the degree to which these highly trained people can be attracted to other professions and employment.

The need for a clearer understanding of student collective-choice behavior is also very clear. All manpower researchers proclaim this need, which is verified by the wide disparaties between their views of the market responsiveness of students. However, these measurements need to go beyond the macromeasurement of the extent to which students alter their college plans based on market conditions.

We need to pay more attention to the *microeconomics* of student-choice behavior; for example, it is a basic tenet of economics that declining economic rewards and poor job prospects will in the long term discourage students from pursuing education. But students who are already in college, when confronted with similar conditions, may be encouraged to go to graduate school to improve their competitive position or "wait out" a bad job market. In addition, there are some indications that market-responsive behavior over the past few years has been concentrated among lower-middle-class students. If this is true, the more traditional collegiate cohort that remains may be less responsive to economic factors. Moreover, recent research on the declining graduate enrollments in the humanities suggests that while the number of graduate applications is declining, the quality may be dropping as well (Scully 1977, p. 9). The hypothesized reason is that the truly exceptional students that have the capability of switching fields are doing so, leaving the students who are going on to graduate school because they do not know what else to do. While these findings are incomplete and are questioned by some economists, the assumption that declining enrollments may lead to a leaner, higher quality humanities is apparently open to question. It is important that we be able to answer these sorts of questions about present and future conditions.

Other fruitful fields for additional study include the career tracks of students, the level of underemployment that exists and the satisfaction of graduates with their employment. Past research has demonstrated a poor fit between most occupations and educations outside of fields such as engineering (Warren 1975). A recent national study supported by the College Placement Council suggests that "attempting to create a perfect fit between college education and careers is a wasted effort because a perfect fit does not matter to the consumers of education—the students" (Bisconti and Solomon 1977). A number of ongoing research programs are examining the dimensions of underemployment and the relation of underemployment to personal satisfaction. There are some indications the difficult market conditions that are making students more competitive and career oriented may also be making them more adaptable and more easily satisfied by employment that does not fully make use of their disciplinary training.

Closer Interaction Between Manpower Approaches—The manpower projection conferences convened by the National Science Foundation, interaction between the National Science Foundation and the Bureau of Labor Statistics, and the outreach efforts of the

BLS are beginning to link forecasters who have previously operated in relative isolation. Forecasters must learn from each other's mistakes, especially as new techniques and research findings lead to more complex models.

However, these interactions must go beyond manpower researchers and the technique of forecasting. The linkages between the occupational and higher education portions of the manpower continuum must be strengthened. It is not enough for higher education to recognize that its graduates in many cases are competing with occupational graduates for jobs. Nor can we tolerate the continued development of completely independent information systems for occupational and higher education. While recognizing the very real differences in how manpower studies should be applied in both spheres, every effort must be made to understand the relationship between the different parts of the manpower continuum. This need is especially great for community colleges, which find themselves heavily involved in both occupational and traditional education.

Conclusions

There is no activity of greater risk than the predicting of the future. Futurecasting is doomed to imperfection regardless of the approach; yet we persist in our efforts because even a small amount of knowledge about an uncertain future can be very valuable. The challenge is to formulate a clear view of the future from many competing viewpoints and to use the information in ways commensurate with the level of uncertainty that is present.

Manpower information and projections in postsecondary education have present value in the sense that they guide today's decisions based on a view of what tomorrow's world will be like. But manpower decisions are complicated by the fact that the decision-maker, be it a government, an institution, or an individual, must also take account of how others will react when making their decisions.

There is no question that manpower approaches in American postsecondary education are growing in scope, sophistication, applicability, and influence. Yet they remain imperfect instruments that must be used with great attention to their inherent limitations and to the nature of decision-making in higher education. The coming years will demand greater care in the application of manpower approaches to postsecondary education, and the penalties for mistaken conclusions promise to be heavy.

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